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FIG. 1.

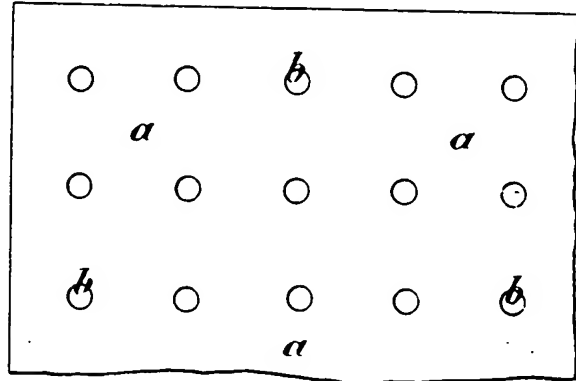


FIG. 2.



FIG. 3.

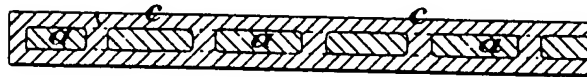


FIG. 4.



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Registers

A.D. 1885, 7th MAY. N° 5626.

An Improved Compound Lining for Boilers or other Vessels
Used in the Manufacture of Paper Pulp from Wood or
other Vegetable Fibre.

COMPLETE SPECIFICATION.

I JOHN MAKIN of Bellfield near Rochdale in the County of Lancaster Paper Mill Manager do hereby declare the nature of my invention for "AN IMPROVED COMPOUND LINING FOR BOILERS OR OTHER VESSELS USED IN THE MANUFACTURE OF PAPER PULP FROM WOOD OR OTHER VEGETABLE FIBRE" and in what manner
5 the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the manufacture and use of a compound protective lining to be applied to the boilers of wrought iron or steel, used for boiling wood or other vegetable fibre with strong acid or corrosive solutions in the manufacture
10 of paper pulp therefrom.

Lead is the best metal for resisting the action of such strong acid or corrosive solutions, but this metal has the property of expanding very considerably by the action of heat and does not in cooling contract or return to its original dimensions and hence lead when used for lining such boilers or vessels soon becomes enlarged
15 in both length and width, and consequently becomes buckled up into ridges, and eventually cracks and breaks.

My invention is intended to support the lead and to keep it in position by the combination therewith in the manner hereinafter described of perforated metal of a firmer quality which will hold the lead fast in its place and obviate its prop-
20 pensity to "creep" or become buckled up into ridges and broken by its excessive expansion and limited contraction as above described.

Such being the nature and object of my said invention I will now proceed to describe more in detail the manner in which the same is to be performed or carried into practical effect and in order that the same may be clearly understood I have
25 annexed hereunto a sheet of drawings illustrative thereof, and have marked the same with figures and letters of reference corresponding with those in the following explanation thereof.

The invention consists in the manufacture of an improved compound lining for wrought iron or steel boilers or vessels, used in the manufacture of paper pulp
30 from wood, by the combination with lead of perforated metal of a more rigid harder and less expansible quality (by preference sheet iron or steel) in the following manner so that the iron or other rigid metal will be intimately connected with the lead forming, as it were, a rigid backbone or skeleton frame to the lead and counteracting its excessive expanding qualities.

[Price 4d.]

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Makin's Compound Lining for Boilers, &c. Used in Manufacture of Paper Pulp, &c.

I perforate the sheet of iron or other rigid metal all over with a number of holes (say from one half of an inch to three inches asunder) more or less according to circumstances, see plan view Fig. 1. and section Fig. 2 on the annexed drawings, *a, a* being the plate and *b, b* the holes, and I then place the same in a mould (both being heated) and I cast thereon a coating of lead in a molten state, by which means the coating of lead *c, c* is formed on both sides of the iron or other rigid metal *a, a* as shown at Fig. 3, and the two coatings are united together through the perforations at close intervals all over the surface.

The consequence of this is that the lead adheres closely to the iron or other rigid metal, and if any unequal expansion of the lead takes place, the effect thereof is minimised as the lead cannot leave the surface of the iron or other rigid metal plate being bound through from side to side as it were, by leaden studs or plugs at each perforation, such leaden studs or plugs being in one piece with the inner, and outer coating of lead and firmly binding the two together.

The area of expansion of the lead therefore is confined to the small spaces between the perforations and can only form a series of shallow blisters all over the surface instead of creeping and buckling into ridges over the whole surface and eventually cracking and breaking as it would otherwise do.

The rigidity of the perforated metal plate also prevents the whole sheet of lead from becoming either longer or wider than its original dimensions and the cracking and breaking of the joints is thus obviated.

I prefer to coat both sides of the iron or other rigid metal plate with lead as above described, but in cases where it is only desired to coat one side of the same I taper or countersink the holes or perforations on the reverse side as shown in section at Fig. 4. so that when the molten lead is run into the mould it flows through the perforations forming taper leaden rivets to hold the lead coating in its place.

In this case the combined lead and metal plate may also be made by placing a plain sheet of lead below a perforated rigid plate and the plugs formed one by one by running lead in by means of a blow pipe or even solder but I prefer the method before described as more satisfactory; or the sheet of lead may be laid upon the perforated rigid metal plate and be forced through the perforations by hydraulic or other pressure.

These combined lead and rigid metal plates are placed inside the boiler or other vessel to be lined, and lead is run in between the joints thereof by means of a blow pipe; and boilers or vessels so lined will be found to resist the action of the heated acid or corrosive solutions for a very much longer time than any lead lined boilers or vessels previously in use.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is

A compound lining for boilers or other vessels used in the manufacture of paper pulp from wood or other vegetable fibre, by the combination of perforated iron or other rigid metal with lead substantially in the manner and for the purposes hereinbefore set forth.

Dated this 6th day of May 1885.

GEORGE DAVIES,
Agent for the Applicant,
4, St. Ann's Square, Manchester.

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